

# Three essays in choice and social choice theory

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# Valorisation

This thesis is comprised of one essay in Choice Theory (Chapter 1) and two essays in Social Choice Theory (Chapters 1 and 2).

Choice theory studies the “thought processes” employed by individuals when making choices and searches for “patterns” in these choices. A well-studied thought process is that of rationality, considered in Chapter 1 and occurring when an individual’s choices are always perfectly logical in the following sense: if solution  $a$  is preferred to solution  $b$ , then solution  $b$  might only be chosen under circumstances where solution  $a$  is not feasible/available.

Although it seems that this thought process is always followed by everyone, this is not the case; consider for example an individual ordering wine, although he prefers beer, simply because he finds him/herself at a fancy French restaurant and does not wish to stand out. Therefore, rationality-related research in choice theory not only attempts to answer the question of “how does an individual’s rationality affect the observed choice patterns?” but also that of “what kind of observed choice patterns indicate that the individual is rational or not?”.

To this effect, Chapter 1 provides some answers to the above questions, under the scenario that the available choices are not mutually exclusive but can be combined. For instance, the individual in the previous example might prefer beer over wine, but might also prefer French cuisine and wine over French cuisine and beer. Therefore, under this new light, his/her choices seem perfectly rational.

Our results, although preliminary when considering their “real-life” applicability, pave the way for more research in the area of “multi-variate” choice, not only in theoretical disciplines but also in applied ones (behavioural economics, psychology, marketing to name but a few) that study individuals’ choices. Perhaps, this could lead to models and/or theories that could better explain the rationality (or its absence) in cases where “multi-variate” choices must be made and, at a more practical level, provide tools for industries offering consumers multiple products in a bundle (for example aeroplane tickets and hotel room combinations in travel-related websites).

Social choice theory studies the collective choices made according to individual “preferences”, over decisions that must be taken collectively, when two or more individuals are concerned.

Examples are numerous and range from everyday situations, like a group of friends having to choose which film to watch at the cinema, to events that can change the course of history, like Hitler being voted Chancellor of the Weimar Republic.

Social choice theory is neither interested in the thought process of the individuals (at least in the majority of the literature), nor on how “good” or “bad” a collective choice is. Instead it attempts to answer the question of “how is the procedure followed to aggregate individual preferences, and reach a collective decision, affected when certain requirements are imposed on this very procedure?”.

For example, although in parliamentary elections in most of Europe the ruling party (or coalition of parties) is always voted for by the relative majority of voters, this is not the case in the USA, where the presidents elected in 2000 and 2016 were not voted for by the relative majority of the voters. Therefore, if we were to require that “the candidate who wins the election must get the relative majority of votes”, the US election system would be ruled out as a method to aggregate individual preferences.

In this spirit, Chapters 2 and 3 propose some requirements on how an aggregation method should treat individual preferences.

Chapter 2 studies the effect of imposing some solidarity requirements on the aggregation method which “guarantee” that following a change in “circumstances”, all individuals will be affected in the same way; they will either all like the effect said change in circumstances will have on the collective choice or they will all dislike it. In other words, as long as one individual dislikes this effect, all others follow suit in solidarity.

To be more specific, the solidarity requirements considered are two. The first, population-monotonicity, considers changes in the population and the effect an addition (or removal) of individuals might have on the collective choice; for example, a couple that takes their kid to the cinema has to also consider his/her preferences as well. The second, replacement-dominance, considers changes in the preferences of an individual, and how these changes might affect the collective choice; for example, the same couple taking their kid to the cinema before or after he/she becomes a teenager (and hence allowed to watch many more movies).

Chapter 3 studies the effect of imposing the following two requirements on the aggregation method.

First, ensuring that all individuals have an equal power in affecting the collective choice; in other words, everyone getting an “equal” vote on the outcome. This requirement is usually satisfied in parliamentary elections (everyone gets one vote) but not in other instances, like a shareholders’ meeting (each share gets one vote, not each shareholder).

Second, that all individuals do not lie, but truthfully “announce” their preference. This requirement is never satisfied in parliamentary elections with more than two parties; if I dislike party *a* the most, I might vote for party *b* that has a fighting chance of winning the election, even though party *c* is my top choice (but does not have a chance of winning).

When considering our results’ applicability outside of theoretical microeconomics, there are two “take-home” messages deriving from them.

First, imposing any of the available combinations of the above described requirements, greatly limit the available aggregating methods which can be used to reach a collective choice. Moreover, since in the theoretical models considered, we assume some strong simplifications, it can be argued that said requirements, are too “demanding”; they would rule out all available aggregating methods in real-life situations -where simplifications cannot be assumed. Simply put, said requirements would be impossible to impose.

Second, an implication that is evident not just from chapters 2 and 3, but from the social choice literature in general, is the need to reconsider the way aggregating methods are chosen in all areas where a collective choice must be reached, either if this concerns how kids are assigned to schools in their district, or if this concerns how governments are elected. That is, the choice of an aggregating method to deal with a voting situation should not depend on whether the method looks attractive and is widely used, but on whether it satisfies certain requirements that are considered positive while avoiding others that are considered negative.